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B tech 1st year chemistry lab viva questions with answers pdf

Water hardness, caused by calcium and magnesium ions, affects its taste, odor, and usability. The total hardness of water is usually expressed as milligrams per liter (mg/L) or milliequivalents per liter (meq/L). EDTA (ethylenediaminetetraacetic acid), a chelating agent, is often used to remove temporary hardness caused by calcium and magnesium ions. EDTA's structural formula is (OOCCH2CH2NHCH2CH2NHCOO)4. Disodium salt of EDTA is preferred due to its easier handling and solubility in water. Ammonia solution is added while preparing EDTA solution to ensure the EDTA remains stable. Buffer solutions, like ammonia-ammonium chloride, are used to maintain a constant pH during titration. Eriochrome Black T indicator changes from wine red to blue as the calcium ions react with EDTA, indicating the end point of the titration. The titration process is slowed towards the end point to avoid overshooting. In environmental engineering practice, hardness data is crucial for water treatment and management. Cements are composed of limestone, clay, sand, and gypsum, with lime being the primary constituent. Glycerol and NaOH facilitate cement's setting process, while diethyl amine helps in its hydration. Brass solutions are prepared by mixing copper and zinc salts. Urea is added to prevent oxidation, while ammonium hydroxide ensures the solution remains alkaline. The bluish-white precipitate formed after adding ammonia solution indicates the completion of the reaction. In this experiment, acetic acid prevents excessive reaction, while liberated iodine is estimated through its reaction with sodium thiosulphate. Starch indicator helps detect the end point by changing color when the excess reagent reacts with starch. The white precipitate produced at the end point signifies the neutralization of the acid. Haematite ore contains iron oxides and is one of many forms of iron ore. Stannous chloride reduces mercuric chloride, while excessive stannous chloride can react with EDTA. The indicator used remains unchanged at the end point due to the reaction's completion. The modern definition (IUPAC) of pH is the negative logarithm of the activity of hydrogen ions. Glass electrodes are called ion-selective electrodes because they measure the concentration of specific ions. Measurement of pH involves calibrating a device using buffer solutions, and pKa values are related to an acid's strength. In this experiment, weak acids have pKa values below 7. The measurement of pH is crucial for determining pKa, as pH increases suddenly after the equivalence point. Chemical oxygen demand (COD) measures organic compounds' ability to consume oxygen. COD tests do not oxidize certain groups of organic compounds, such as esters and amines. Silver sulphate and mercuric sulphate are used in COD analysis to form products that can be measured. Ferroin is composed of iron(III) sulfate and ammonium thiocyanate. The COD test has various applications in environmental engineering, including monitoring wastewater quality and evaluating the effectiveness of treatment processes. The Limitations of COD: The limitations of Chemical Oxygen Demand (COD) include its inability to differentiate between organic and inorganic compounds, as well as its sensitivity to interferences from other substances. Potentiometer Titration: A potentiometer titration is a method used to determine the endpoint of a chemical reaction by measuring the potential difference between two electrodes. Principle of Potentiometer Titration: The principle behind this method is that the potential difference between the electrodes changes when the reactants in the solution reach the equivalence point, allowing for the accurate determination of the endpoint. Electrodes Used: In potentiometer titration, a reference electrode and an indicator electrode are used. Determining Factor: The determining factor in oxidation-reduction reactions is the ratio of oxidized to reduced species. Indicator Electrode: An indicator electrode is an electrode that changes its potential when a chemical reaction occurs. Reaction between FAS and Potassium Dichromate: The reaction between formaldehyde-sulfite-ascorbic acid (FAS) and potassium dichromate is an oxidation-reduction reaction, which results in the reduction of the dichromate ions to Cr3+ and the oxidation of the ascorbic acid. Advantages of Potentiometric Titration: The advantages of potentiometric titration include its high accuracy, precision, and speed. Colorimetry: Colorimetry is a method used to determine the concentration of a substance based on the intensity of light absorbed by that substance. Principle of Colorimetry: The principle behind this method is that the absorption of light by a substance is directly proportional to its concentration. Photoelectric Colorimeter: A photoelectric colorimeter is an instrument that uses photocells to measure the intensity of light absorbed by a substance. Filters: Filters are used in colorimetry to eliminate unwanted wavelengths from the light source and to isolate specific absorption bands. Wavelength, Frequency, Wave Number: These terms describe the properties of electromagnetic radiation. Calibration Curve: A calibration curve is a graph that shows the relationship between the absorbance of a substance and its concentration. Transmittance: Transmittance refers to the percentage of light transmitted through a solution. Criteria for Satisfactory Colorimetric Analysis: The criteria for satisfactory colorimetric analysis include accuracy, precision, and reproducibility. Advantages of Photoelectric Colorimetric Determination: The advantages of photoelectric colorimetric determination include its speed, accuracy, and precision. Blank Solution: A blank solution is a solution that contains only the solvent and no substance being analyzed. Ammonia Added: Ammonia is added to the solution to increase its absorbance at specific wavelengths. Estimation of Copper Done: The estimation of copper is done at 620 nm wavelength because this wavelength corresponds to the absorption maximum of copper. Ohm's Law: Ohm's law states that the current flowing through a conductor is directly proportional to the voltage applied and inversely proportional to the resistance. Conductance: Conductance refers to the ability of a substance to conduct electricity. Unit of Conductance: The unit of conductance is Siemens per centimeter (S/cm). Types of Conductivities: There are three types of conductivities: specific conductivity, equivalent conductivity, and molar conductivity. Specific conductivity refers to the conductivity of a solution per unit volume. Equivalent conductivity refers to the conductivity of a solution per unit quantity of solute. Molar conductivity refers to the conductivity of a solution per unit amount of solute. Cell: A cell is an electrochemical device that measures the potential difference between two electrodes. Principle Involved in Conductometric Titration: The principle involved in conductometric titration is that the conductivity of a solution changes when the reactants reach the equivalence point, allowing for the accurate determination of the endpoint. Accuracy of Method Determined: The accuracy of the method is determined by comparing the measured value with the known value. Advantages of Conductometric Titration: The advantages of conductometric titration include its high accuracy, precision, and speed. Viscosity: Viscosity refers to the measure of a liquid's resistance to flow. Viscosity-Coefficient: Viscosity-coefficient is a dimensionless quantity that describes the viscosity of a liquid. Density of Liquid: The density of a liquid refers to the mass per unit volume. Specific Gravity: Specific gravity is a dimensionless quantity that relates the density of a liquid to its solvent. Relationship between Specific Gravity and Density: The specific gravity and density are directly proportional. SI Unit of Viscosity-Coefficient: The SI unit of viscosity-coefficient is poise (P). Factors Affecting Viscosity: The factors that affect the viscosity of a liquid include temperature, pressure, and solute concentration. Variation of Viscosity with Temperature: The viscosity of a liquid decreases with increasing temperature. Acetone Used for Cleaning Viscometer: Acetone is used to clean viscometers because it dissolves and removes any impurities that may affect the measurement. Laboratory Temperature Required: Laboratory temperature is required for viscosity determination because changes in temperature can affect the viscosity of a liquid. Viscosity Related to Mobility: The viscosity of a liquid is related to its mobility, with more viscous liquids having lower mobility. Fluidity of Liquid: The fluidity of a liquid refers to its ability to flow easily.